

ANNUAL REPORT

Neonatal Abstinence Syndrome in Kentucky



Annual Report on 2015 Births

From the Public Health Neonatal Abstinence Syndrome
Reporting Registry

Kentucky Department for Public Health
Division of Maternal and Child Health

June 2017



Kentucky Public Health
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Suggested Citation: Kentucky Cabinet for Health and Family Services. Neonatal Abstinence Syndrome in Kentucky: Annual Report on 2015 Births. Frankfort, KY: KY Cabinet for Health and Family Services, Department for Public Health, Division of Maternal and Child Health, 2017.

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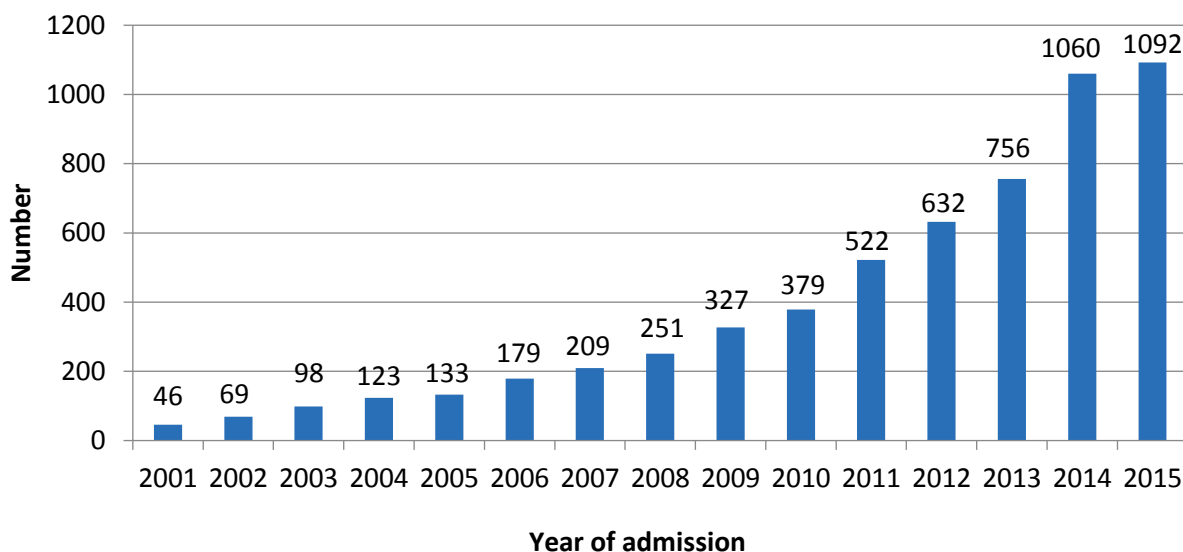
Annual Report on 2015 Births

Neonatal Abstinence Syndrome Reporting Registry

Substance abuse has reached epidemic levels in Kentucky and across the nation. In the 2015 Title V needs assessment in communities across the state, substance abuse was the top concern over all other health issues. Kentucky has a significant public health crisis with regards to substance use disorder, particularly prescription and illicit opiates. The Commonwealth has seen a substantial increase in opiate use, a significant increase in the number of babies born with neonatal abstinence syndrome (NAS), and an increase in blood-borne diseases from intravenous drug use, including hepatitis C and human immunodeficiency (HIV). Kentucky has also experienced an explosion in overdose deaths over the past decade. In 2014, Kentucky had the fourth highest age-adjusted drug overdose death rate in the nation at 24.7 deaths per 100,000 population compared to 14.7 per 100,000 in the U.S. (Rudd, Aleshire, Zibbell, & Gladden, 2016). In 2015, there was an increase to 28.7 deaths per 100,000 population, and pharmaceutical opioids remained the primary cause of overdose deaths in Kentucky (Akers, 2016).

Pharmaceutical opioids are driving this epidemic, and pregnant women and their children have been significantly impacted. There are negative consequences of drug use for pregnant women including increased risks of assault and abuse, miscarriage, and contracting hepatitis or HIV (Wilder, Lewis, & Winhusen, 2015). Each year thousands of infants are exposed to substances while in the womb. While we know that alcohol and nicotine do more known damage to the fetus than all other substances, the baby who is chronically exposed to opioids and other drugs will often experience a constellation of withdrawal signs after birth, called NAS. The rates of opioid abuse during pregnancy have increased nationally and in Kentucky. Tolia et al (2015) report an almost four-fold increase in admissions to neonatal intensive care units (NICUs) for NAS from 7 cases per 1000 NICU admissions in 2004 to 27 cases per 1000 admissions in 2012. An analysis of the incidence of NAS in 28 states from 1999 to 2013 demonstrated that the incidence of NAS increased almost 300% during that time period from 1.5 to 6.0 cases per 1,000 hospital live births (Ko et al., 2016). The rate of NAS in Kentucky in 2013 was reported as 15.0 cases per 1,000 hospital live births (Ko et al., 2016). In Kentucky, data from hospital discharge records indicate the number of newborns with NAS has increased 23-fold since 2001 (46 in 2001 vs. 1092 in 2015; Figure 1). These data are based on inpatient hospitalization claims that have an International Classification of Diseases (ICD) – 9-CM (779.5) or ICD-10-CM code (P96.1) for NAS as well as a code for being a live birth. Nationally and in Kentucky, about 80% of these infants are covered by Medicaid.

Figure 1. NAS Hospitalizations of Kentucky Resident Newborns, 2001 – 2015.



NAS is defined by any mention of the ICD-9-CM codes 779.5 and V3x, or of the ICD-10-CM codes P96.1 and Z38. The U.S. transition to ICD-10-CM occurred on October 1, 2015. The transition to ICD-10-CM should be considered as a possible contributor to any changes in trend observed between 2014 and 2016.

Years on the time axis represent the admission date (not the discharge date).

Produced by Kentucky Injury Prevention Research Center, August, 2016

Data source: Kentucky Inpatient Hospitalization Claims Files, Years 2001-2015; Cabinet for Health and Family Services, Office of Health Policy

Data for 2010-2015 are provisional and subject to change.

In order to better understand and combat this growing epidemic of substance abuse, the Kentucky General Assembly has enacted several laws. Specifically for NAS, one step was to collect better data by making NAS a public health reportable disease/condition to understand the extent of the problem. Kentucky Revised Statute (KRS) 211.676 requires the reporting of NAS cases to the Department for Public Health. KRS 211.678 calls for an annual report of de-identified, aggregate statistical data from this reporting. This data summary reports relevant findings from data collection for calendar year 2015 of NAS as a reportable public health condition.

KRS 211.676: All cases of neonatal abstinence syndrome (NAS) diagnosed among Kentucky resident births shall be reported to the Kentucky Department for Public Health by the facility where NAS is diagnosed. The report shall be made at the time of NAS diagnosis pursuant to guidance issued by the department.

Neonatal Abstinence Syndrome

NAS is the collection of signs babies experience in withdrawing from drugs they were chronically exposed to in utero. When the umbilical cord is cut at delivery, these substances no longer circulate to the baby, and the baby's physiology has to re-adjust to a drug-free environment. NAS is a clinical diagnosis based on signs and symptoms that are not unlike withdrawal in adults. It was classically described as withdrawal from opioid medications taken by the mother and was first documented in 1875 (Kocherlakota, 2014). Morphine treatment for neonates began as early as 1903 (Kocherlakota, 2014). However, symptoms of withdrawal can be seen with many drugs other than opiates and narcotics, including medications that are taken correctly and by a physician's prescription [Table 1]. NAS is managed the same whether the exposure is opiates or other drugs.

Table 1. Non-narcotic drugs that cause neonatal psychomotor behavior consistent with withdrawal.

| Drug | Signs | Onset of Signs | Duration of Signs ^a | Ref. No. |
|------------------|---|----------------|---------------------------------|----------|
| Alcohol | Hyperactivity, crying, irritability, poor suck, tremors, seizures; onset of signs at birth, poor sleeping pattern, hyperphagia, diaphoresis | 3–12 h | 18 mo | 14,15 |
| Barbiturates | Irritability, severe tremors, hyperacusis, excessive crying, vasomotor instability, diarrhea, restlessness, increased tone, hyperphagia, vomiting, disturbed sleep; onset first 24 h of life or as late as 10–14 d of age | 1–14 d | 4–6 mo with prescription | 12,13 |
| Caffeine | Jitteriness, vomiting, bradycardia, tachypnea | At birth | 1–7 d | 161 |
| Chlordiazepoxide | Irritability, tremors; signs may start at 21 d | Days–weeks | 9 mo; 11/2 mo with prescription | 11 |
| Clomipramine | Hypothermia, cyanosis, tremors; onset 12 h of age | | 4 d with prescription | 162 |
| Diazepam | Hypotonia, poor suck, hypothermia, apnea, hypertonia, hyperreflexia, tremors, vomiting, hyperactivity, tachypnea (mother receiving multiple drug therapy) | Hours–weeks | 8 mo; 10–66 d with prescription | 10 |
| Ethchlorvynol | Lethargy, jitteriness, hyperphagia, irritability, poor suck, hypotonia (mother receiving multiple drug therapy) | | Possibly 10 d with prescription | 163 |
| Glutethimide | Increased tone, tremors, opisthotonos, high-pitched cry, hyperactivity, irritability, colic | | 6 mo | 164 |
| Hydroxyzine | Tremors, irritability, hyperactivity, jitteriness, shrill cry, myoclonic jerks, hypotonia, increased respiratory and heart rates, feeding problems, clonic movements (mother receiving multiple drug therapy) | | 5 wk with prescription | 58 |
| Meprobamate | Irritability, tremors, poor sleep patterns, abdominal pain | | 9 mo; 3 mo with prescription | 165 |
| SSRIs | Crying, irritability, tremors, poor suck, feeding difficulty, hypertonia, tachypnea, sleep disturbance, hypoglycemia, seizures | Hours–days | 1–4 wk | 31–33,35 |

^a Prescription indicates the infant was treated with pharmacologic agents, and the natural course of the signs may have been shortened.

Source: Hudak et al. Neonatal Drug Withdrawal. *Pediatrics* 2012, 129(2):e542.

Babies experiencing withdrawal have irritability expressed as high-pitched cry, restlessness, hyperactive reflexes, myoclonic jerks, jitteriness, tremors, seizure; gastrointestinal disturbances including poor feeding, vomiting, and loose stools; and other symptoms including fever, sweating, mottling, nasal flaring, apnea, and tachypnea. The severity of symptoms is typically assessed by the Finnegan Scoring method, a scale assigning a numerical score for each of the symptoms. Babies are first treated with non-pharmacologic comfort measure like holding, rocking, reduced lighting, and minimal disturbances. When Finnegan scores rise and symptoms prevent the babies from sleeping, eating, and gaining weight, they may be put on medications. Over time, these medications are tapered down slowly.

Case Definition for reporting: Kentucky birthing hospitals are instructed to report any infant with history or suspicion of perinatal substance exposure that exhibits the signs and symptoms consistent with NAS.

Unlike cases reported from hospital discharge diagnoses, the cases for the NAS Public Health Reporting are not tied to a specific ICD-10 code because it was discovered early in the reporting process that many physicians and facilities have been reluctant to use the NAS-specific code unless the infant requires medications to treat these symptoms. Infants who respond to non-pharmacologic treatment and who do not require medications are still experiencing withdrawal and are to be reported. There is a wide range in the literature, but overall about 55-94% of substance-exposed infants will go through withdrawal (Hudak & Tan, 2012; McQueen & Murphy-Oikonen, 2016). There is misinformation in the field that if the mother is on buprenorphine the baby will not have withdrawal, but this is false. NAS incidence rates among infants born to mothers treated with methadone range from 45-65% and with buprenorphine from 22-63%. (Wiegand et al., 2015). Severity of NAS symptoms does not correlate with a mother's dose of opioid.

Statistical Data

Number of Reported Cases: There were 1,733 reports to Public Health during the calendar year of 2015, which represent 1,354 unduplicated cases. Infants who are born at one hospital and transferred to a higher level of care will have two reports, so these duplicate reports have been eliminated for analysis. That means, conservatively, there are 1,354 cases of symptomatic NAS in Kentucky resident births in the 12 months of reporting, or over 110 new cases of NAS in infants born each month in Kentucky. The reported numbers of NAS may be an underestimate due to incomplete facility reporting and diagnosis of NAS post-discharge. These data are based on reporting to Public Health while the data in Figure 1 (1,092) is based on de-identified administrative claims data.

| |
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| In calendar year 2015, there were 1,354 unduplicated cases of NAS reported to the Department for Public Health. This represents over 110 new cases of NAS each month in Kentucky. |
|---|

Age at onset of symptoms: The onset of symptoms for NAS is variable but typically occurs 48-72 hours post-birth among infants with prenatal opioid exposure, although delayed onset of up to four weeks post-birth has been documented (H. E. Jones & Fielder, 2015). Kentucky's data shows a wide range for the onset of symptoms of withdrawal in newborns. The earliest onset was 30 minutes after birth and the latest reported was 168 hours (7 days) after birth, which is within the range of age of onset reported in the literature. The average age of onset of NAS signs to appear from the Kentucky data was 26 hours of age. Onset of manifestations can be affected by the time of the mother's last dose, the duration of the exposure, the total accumulation of the exposure, and if the neonate was exposed to more than one substance (Kocherlakota, 2014) [Table 2]. Note that methadone, buprenorphine and other opioids may not have onset of symptoms until after 48 hours of age.

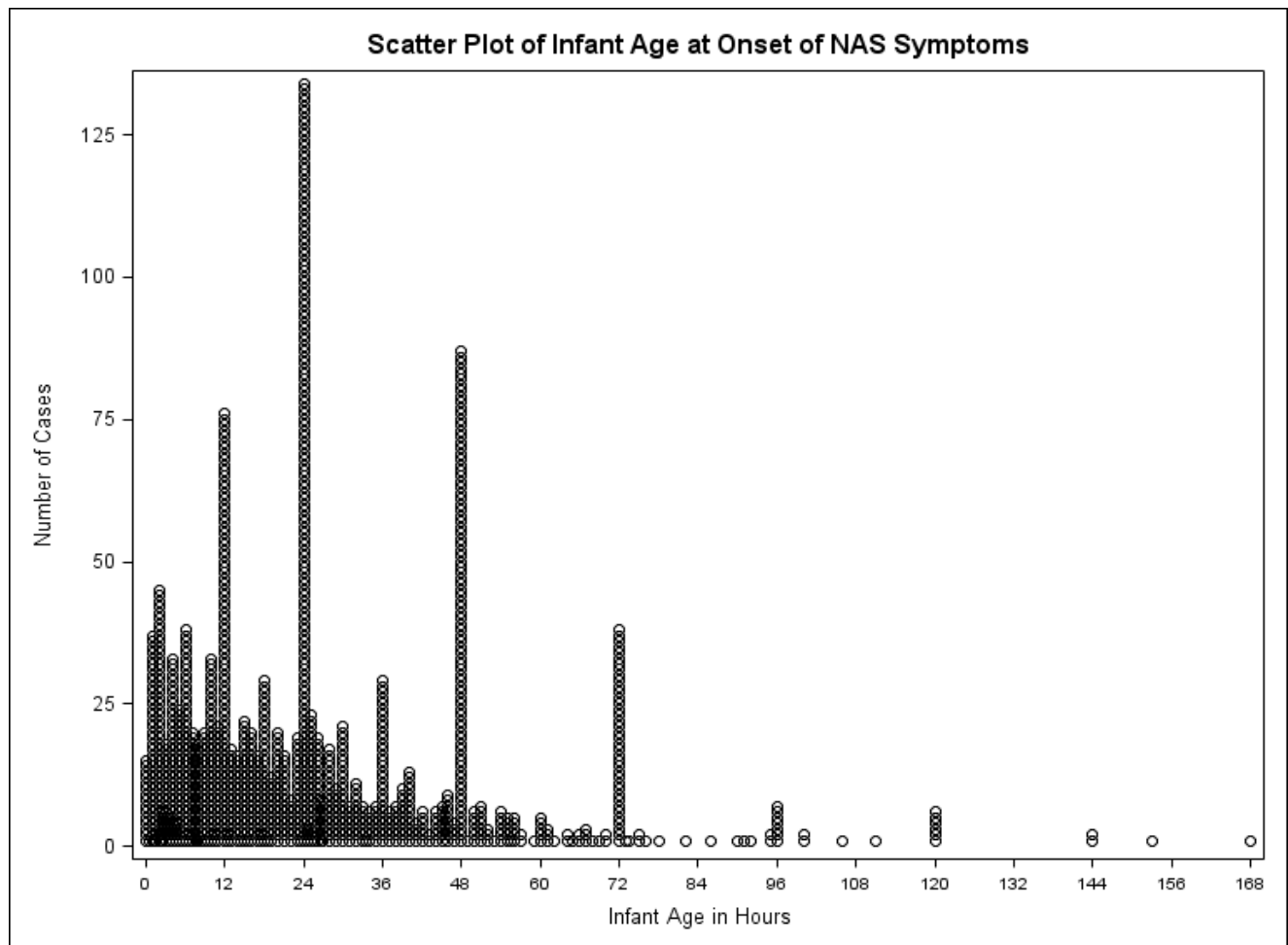
Table 2. Onset, Duration, and Frequency of NAS caused by various substances.

| Drug | Onset, h | Frequency, % | Duration, d |
|---------------------------------|----------|------------------------|------------------|
| Opioids | | | |
| Heroin | 24–48 | 40–80 ²⁷ | 8–10 |
| Methadone | 48–72 | 13–94 ³⁷ | Up to 30 or more |
| Buprenorphine | 36–60 | 22–67 ^{46,48} | Up to 28 or more |
| Prescription opioid medications | 36–72 | 5–20 ^{56,60} | 10–30 |
| Nonopioids | | | |
| SSRIs | 24–48 | 20–30 ⁶⁴ | 2–6 |
| TCAs | 24–48 | 20–50 ⁶⁴ | 2–6 |
| Methamphetamines | 24 | 2–49 ¹⁰¹ | 7–10 |
| Inhalants | 24–48 | 48 ⁷⁰ | 2–7 |

Source: Kockerlakota, P. Neonatal Abstinence Syndrome. *Pediatrics* 2014; 134:3552.

To evaluate risk of NAS for a substance-exposed infant, physicians treating the infant must be knowledgeable about the characteristics of the specific substances to which the infant was exposed. Both methadone and buprenorphine are long acting drugs and may take a long time to be eliminated from the baby's body, resulting in delayed onset of symptoms. Clinically, this is important because these exposed infants should not be discharged at the usual 48 hours of life simply because they have no symptoms. The American Academy of Pediatrics (Hudak & Tan, 2012) and the World Health Organization guidelines (World Health Organization, 2014) recommend infants with known fetal exposure to these drugs be observed in the hospital a minimum of 4-7 days to be sure they do not return home and experience withdrawal there. Withdrawal at home is not only frustrating for the family, but could be dangerous for the baby as dehydration from poor feeding, vomiting, or diarrhea can occur in just a few hours, and neurologic irritability can result in seizures. Families who seek medical attention for the baby after discharge may not bring up a history of substance use during the pregnancy, and the symptoms may not be recognized as NAS. Reported cases validate the recommendation to observe these infants in the hospital for 4-7 days, even if there are no symptoms of NAS. Of those cases reported to Public Health, 18% (one in 6) had onset of symptoms after 48 hours as indicated in Figure 2.

Figure 2. Infant Age at Onset of NAS Symptoms.



Source: Kentucky Neonatal Abstinence Reporting Registry, 2015.

Substances associated with NAS: In the Kentucky reporting data, the most reliable source for identifying substances used during pregnancy comes from maternal history. Of the 1,354 babies reported with NAS, 90% had positive maternal history for substance use, 77% of the mothers had a positive drug test, and 76% of the babies had a positive drug test. This is consistent with the many issues around positive drug screens and the lack of reliability of point in time testing, timing of the test related to drug metabolism, and other reasons for false positive and false negative tests.

Of the mothers of babies with NAS, close to half (47.6%) were prescribed a medication as treatment for addiction, 13.4% were on a supervised pain therapy program, and 4.1% had prescriptions to treat a psychiatric or neurological condition prior to delivery. Prescribing practices have clearly played a significant role in the rise of prescription opioid use and abuse. Most pregnant women using/abusing substances were doing so before they became pregnant (Jones, 2015).

The most common substance used by the mothers in the reported NAS cases was buprenorphine, the active drug in Subutex and Suboxone. Close to half (48.7%) of the mothers reported using buprenorphine by history, and 30.8% of mothers tested positive for buprenorphine [Table 3]. Of the women with a positive history or test for buprenorphine, half reported it as the only drug they were taking, which may reflect successful treatment and control of addiction. The goal of medication assisted treatment (MAT) for addiction would be to have the person stabilized and taking only one drug. However, many of these women have co-occurring disorders such as depression or anxiety that require medications for treatment, so those using more than one medication may be in compliance with treatment by their health care providers. Additionally, with such widespread use of buprenorphine, there are concerns that pregnant women are accessing prescriptions for buprenorphine without the required behavioral/mental health treatment component of addiction or drug dependence (medical supervision, counseling, and peer support and other services) of MAT; new regulations from the Kentucky Board of Medical Licensure with requirements for buprenorphine prescribers should help address this issue. The most common substances of exposure for NAS did not change from the previous annual report for maternal history or maternal test positive. However, there was a change in the order of substances in which the infant tested positive. The last annual report, 27.6% of infants tested positive for Other Opiates and 26.1% were positive for buprenorphine. With the 2015 data, those two substances have switched order for the infants with 30.7% being positive for buprenorphine and 27.3% being positive for Other Opiates. This reflects an 18% increase in the infants that tested positive for buprenorphine.

Table 3. Most Common Substances of Exposure for NAS Infants.

| Most Common Substances of Exposure for NAS Infants* | | | | | |
|--|----------|--|---------------------------------------|----------|--|
| Positive by Maternal History (past or current use this pregnancy) | % | | Positive by Maternal Drug Test | % | |
| Buprenorphine | 48.7 | | Buprenorphine | 30.8 | |
| Other Opiates | 30.8 | | Other Opiates | 20.3 | |
| Oxycodone | 19.6 | | Cannabinoid | 12.3 | |
| Cannabinoid | 17.5 | | Oxycodone | 10.7 | |
| Heroin | 16.4 | | Benzodiazepines | 6.1 | |
| Benzodiazepines | 10.3 | | Heroin | 6.0 | |
| | | | | | |

*Note: Data reflects unduplicated, symptomatic, KY residents only

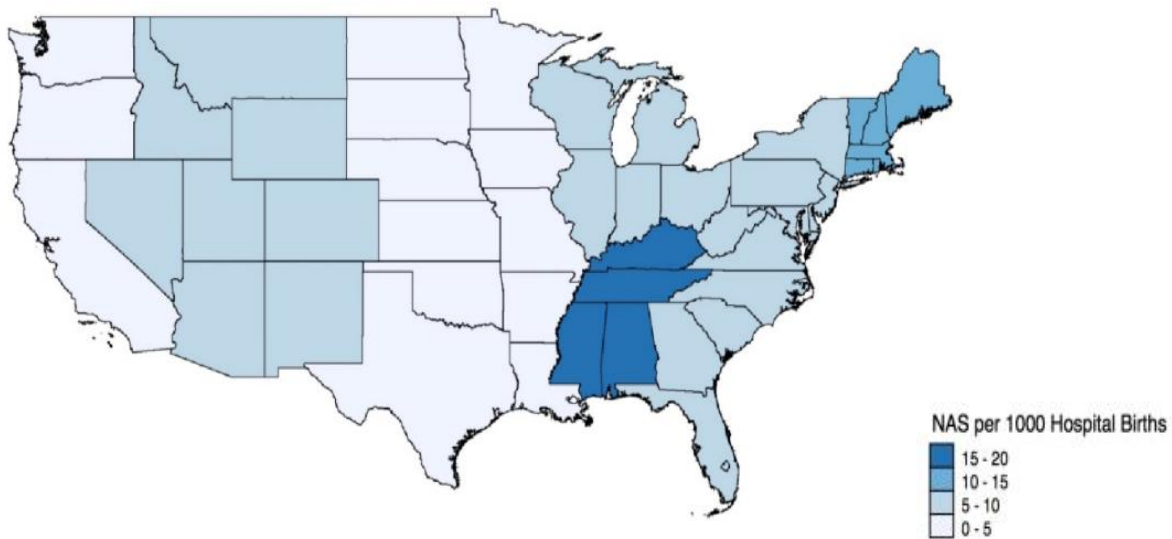
Source: Kentucky Neonatal Abstinence Reporting Registry, 2015.

Another drug that is emerging in our reporting as a cause of NAS is gabapentin (Neurontin), an anti-seizure medication, that is also used for nerve pain. Neonatologists in Kentucky have noticed this and report that infants exposed to gabapentin in utero can go through a severe withdrawal that is difficult to treat. According to data from the NAS registry, 5.3% of women reported a history of gabapentin use. Only one published study describes gabapentin and NAS (Carrasco, Rao, Bearer, & Sundararajan, 2015), so there is much to learn about managing this drug as a cause of NAS in the future.

Geographic Distribution: There are known geographic patterns of prescription drug abuse. Kentucky has been at the epicenter of the epidemic since the rise of oxycontin use two decades ago. Similarly, the geographic distribution of NAS also shows Kentucky to have one of the highest incidence rates in the

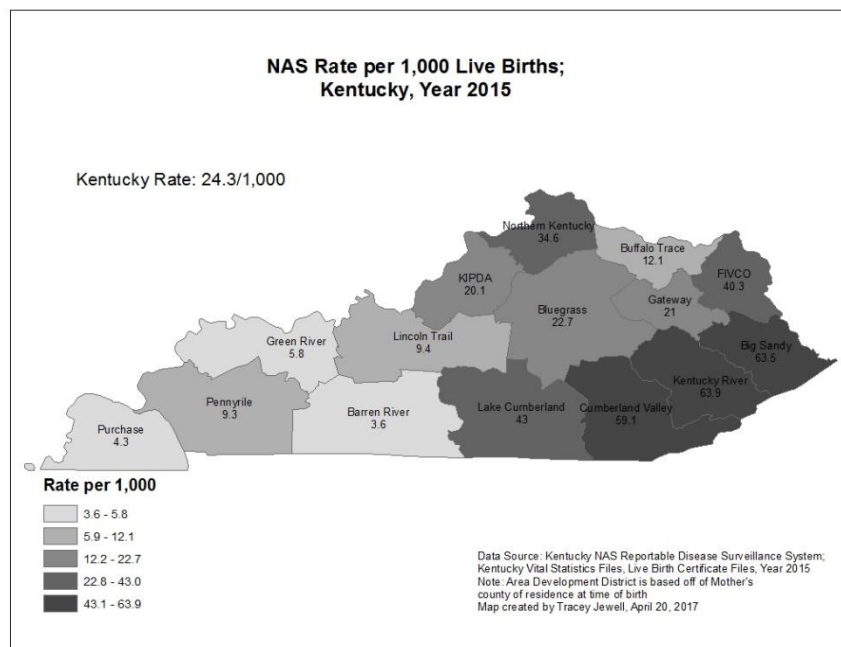
country (Patrick, Davis, Lehmann, & Cooper, 2015)[Figure 3]. From the Public Health reporting of NAS, the geographic distribution of NAS within the state shows the incidence of NAS is heavily weighted toward the southeastern part of the state in Appalachian counties [Figure 4]. The rate of NAS in the southeastern portion of Kentucky is approximately 2.5 times higher than the statewide rate.

Figure 3. Geographic Distribution of Neonatal Abstinence Syndrome in the US.



Source: Patrick SW, Davis MM, Lehmann CU, Cooper WO. Increasing Incidence and Geographic Distribution of Neonatal Abstinence Syndrome: United States 2009-2012. *JPerinatol* 2015. 35(8): 650-655.

Figure 4. NAS Rate in Kentucky by Area Development District, 2015.



Treatment of NAS: Despite the activity around NAS nationwide, there remains no consensus as to management and medical treatment of NAS. Generally, infants at risk for NAS are monitored from birth using the Finnegan scoring tool every 2-4 hours. Non-pharmacologic treatments such as dim lighting, swaddling, small frequent feedings with a high calorie formula, and monitoring of weight loss/gain are typically implemented from birth. If these measures fail to control the symptoms, and symptoms become so intense they prevent the infant from eating, sleeping, and gaining weight -- all necessary for normal development -- then medications are begun. Among infants prenatally exposed to opioids, 21% to 94% will develop symptoms of NAS significant enough to require treatment (Sutter, Leeman, & Hsi, 2014). The factors that determine which infants will develop symptoms and which infants have more severe symptoms are not well understood and likely depend on the substances used as well as genetic, epigenetic, and environmental factors (Sutter et al., 2014).

In the Kentucky reporting data, 55.4% of the babies with NAS symptoms reached scoring levels that required pharmacologic treatment. The most common drug used to treat NAS is morphine, but methadone, phenobarbital, and clonidine are also used. 30.8% of babies with NAS were treated with morphine alone in 2015 and 11.1% received a combination treatment of morphine and clonidine. The goal of treatment is to control the symptoms so that the baby is able to have developmentally-appropriate sleep and adequate intake to support nutrition. Once the baby's symptoms are controlled, the medications are slowly tapered over several days until they can be discontinued. Average length of stay for NAS is shorter in hospitals that use a standardized protocol for identification, management, and tapering medications regardless of medication chosen for treatment (Hall et al., 2014).

Not all NAS infants have to be treated in Neonatal Intensive Care Units (NICUs). Even if treated with a medication, morphine is generally administered orally and IV's are not typically required. In fact, "rooming in" which means allowing the baby to stay in the same room with the mother has been shown to reduce the length of stay for NAS by up to 50%, even if the infant requires medications to treat NAS (Abrahams et al., 2007; Jansson & Velez, 2012). Rooming in also provides the mother the opportunity to learn and practice skills for feeding, calming, and caring for the infant, which will improve the likelihood of safe and successful transition to home care. When mothers are participating in a comprehensive treatment program that includes substance abuse treatment and supports such as housing, transportation, counseling, parenting training and coaching, discharge can be accomplished on average in 5-6 days (Wiegand et al., 2015).

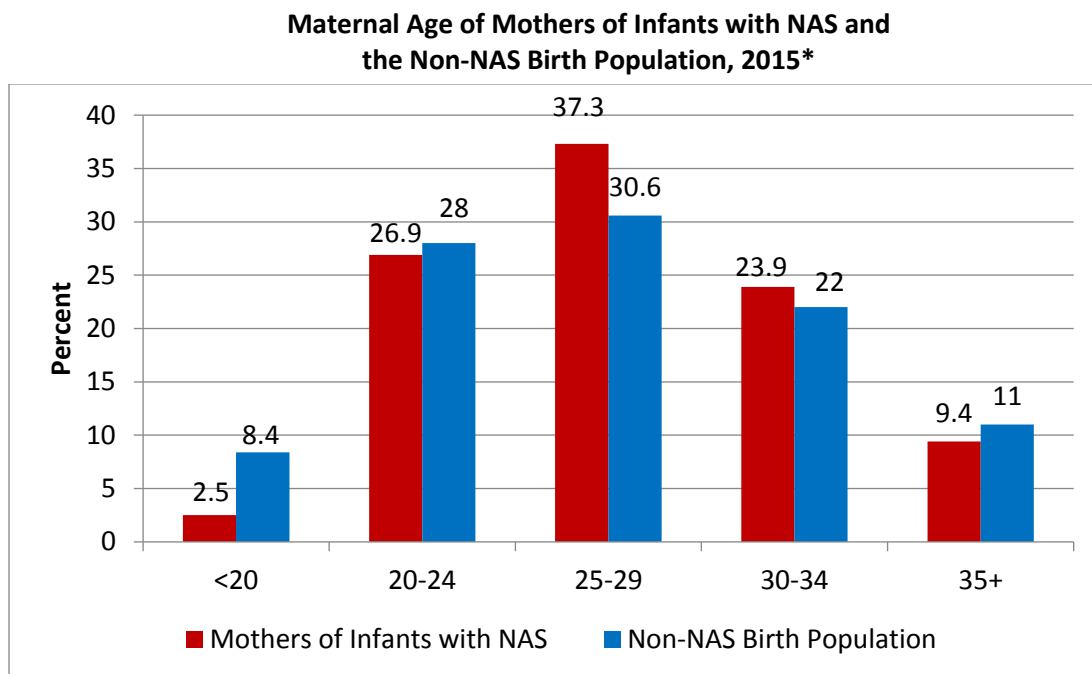
There are several known factors that make NAS more difficult to treat. Infants exposed to more than one substance (poly-substance use) are more difficult to treat than those exposed to only one substance. Most babies with NAS have been exposed to poly-substance use. Based on maternal history, 50.8% of the babies with NAS in 2015 were exposed to poly-substance use not including nicotine/tobacco. Several studies have shown that NAS is more difficult to treat if mother smoked or used benzodiazepines (anxiety medications) or SSRI's (antidepressants). Both depression and anxiety are common in this population. In Kentucky, 80% of mothers of NAS infants reported smoking compared to 18% of pregnant women in the remaining birth population. Studies have shown use of nicotine by the pregnant women to be associated with the need for medication to treat NAS (Kaltenbach et al., 2012), greater dose of medication needed to treat NAS (H. E. Jones et al., 2013; Kaltenbach et al., 2012), increased number of days treated with medication (H. E. Jones et al., 2013), and prolonged length of hospital stay (H. E. Jones et al., 2013).

Maternal and Infant Characteristics

By linking the NAS reporting information to vital statistics data, aggregate differences between mothers of babies with NAS and mothers in the general birth population can be studied. Medicaid was the payment source for delivery among 83% of the infants reported with NAS. Almost 96% of the Kentucky mothers of reported babies with NAS are non-Hispanic White. Notably, in the Kentucky reporting data, there are very few teen mothers of babies with NAS (2.5% of mothers of babies with NAS are teens compared to 8.4% of mothers in the non-NAS birth population). Over 88% of mothers of babies with NAS are between the ages of 20 and 34 [Figure 5]. This is also consistent with the fact that ongoing substance use in women is often driven by a long history of traumatic experiences, such as domestic violence, abuse, or a partner using drugs. Without treatment for these traumas, the continued abuse of substances as a means of coping remains and is an obstacle to successful recovery.

Perhaps because these are older mothers, the majority (80%) of NAS births were to mothers who already had other children. Notably, it is also reported that almost 90% of pregnancies in women with substance use disorder are unintended (Heil et al., 2011). Given that most pregnancies in women with substance use disorder are unintended, all women chronically on opioid therapy and all women who have given birth to a baby with NAS should be counseled about options for long-acting, reversible contraception. Ideally this should happen before they are discharged from the hospital after giving birth. This could potentially prevent a significant number of new cases of NAS.

Figure 5. Maternal Age of Mothers with NAS Infants vs. Mothers in the general birth population whose infants did not have NAS.



Source: Kentucky Neonatal Abstinence Reporting Registry, 2015 linked to Live Birth Certificate Files, 2015, Office of Vital Statistics

*Data are preliminary and numbers may change.

Outcomes for Neonatal Abstinence Syndrome: Collecting better data on infants with NAS will result in a better ability to assess outcomes. This will include linking to vital statistics files to determine if the risk of infant death in the first year of life is increased compared to other births. In cases reviewed by the Child Fatality and Near Fatality External Review Panel, several infants who were diagnosed with symptoms of NAS at birth later became child fatality victims, either from unsafe sleep (such as bed-sharing, often with an impaired adult), or from pediatric abusive head trauma. In FY15, the most common risk factor identified among all cases was substance abuse in the caregiver which was noted in 37% (43 of 116) of the cases reviewed (Child Fatality and Near Fatality External Review Panel, 2016). Because babies with NAS can have irritability and feeding problems for months after discharge, they are likely to be at higher risk for these deaths.

However, parental substance use disorder does not necessarily result in child harm or neglect (American College of Obstetricians and Gynecologists Committee on Ethics, 2015). There are reasons to be concerned about in-utero drug exposure and NAS. Whether prenatal opioid exposure and or postnatal opioid treatment has any long-term effects on the newborn brain is largely unknown (Kocherlakota, 2014). Long-term outcomes studies have been small and inconclusive. What is known is that extremes of family dysfunction, including substance abuse in the home, mental illness in a parent, domestic violence, separation from a parent, and a family member in jail, are all Adverse Childhood Experiences (ACEs) that have lifelong effects (Felitti et al., 1998). Thus, in the period after birth while the infant's brain is being hardwired, the home environment of the infant may be the most critical to long-term outcomes. It is also the period when the new mother has the least access to treatment and supports that could stabilize her life, which is even more stressful after the birth of a new baby. The symptoms seen at school age in babies with NAS - inattention, speech delay, and behavior and learning problems - are the same things seen with toxic stress from an environment in which there are multiple Adverse Childhood Experiences. Interventions for NAS from birth and after discharge can mitigate the effects of toxic stress but must focus on the maternal-infant dyad, not just the child, and address the stressors in the environment.

The best way to assure optimal outcomes for babies with NAS is to provide comprehensive treatment and supports for the mothers with substance use disorder. This will stabilize the home environment and promote the attachment and bonding that literally hardwires the baby's brain and establishes brain pathways for social-emotional and cognitive functioning. Although foster care is necessary in some cases to assure the infant's safety, foster care also puts at risk the opportunity for the stable nurturing relationship and attachment that is necessary for hardwiring the infant's brain. These infants often experience multiple placements and lack a constant, caring adult in their lives to establish the bonding necessary for healthy brain development. Nationally, there is variability in how often these babies are discharged home with their natural mother ranging from 49% to 94% (Bada et al., 2008; Reid et al., 2015). This highlights the critical importance of treatment and supports after discharge. One comprehensive program reports that of women who complete the program, 75% of families in the outpatient program had positive changes (e.g., closed child protective cases, children re-united) and 100% of families in which mothers completed residential treatment had positive changes (H.E. Jones, 2015). These programs provide substance abuse treatment and supports for up to 12 months with six months aftercare.

"The complexity and challenging nature of the home atmosphere should never be underestimated in these situations. The importance of an optimal home environment for the global development of these children should be emphasized." Kocherlakota, 2014

Summary and Next Steps

Data from the NAS Public Health Reporting Registry provides valuable information on specific characteristics of NAS cases in Kentucky that can be used for comparison to the US, better monitor trends in Kentucky, and allow for targeted interventions to be developed to address this problem. Some of the current activities underway specifically to address issues of substance abuse in pregnancy and NAS include:

- In 2016, Kentucky Governor Matt Bevin signed a two-year budget with a total of \$15.7M in FY 2017 and \$16.3M in FY 2018 allocated to the Kentucky Justice and Public Safety Cabinet to combat heroin and substance abuse in the Commonwealth. With the FY 2017 funding allocation, \$2.5M was set aside for established programs to address neonatal abstinence syndrome by developing or expanding comprehensive evidence-based residential treatment services, transitional housing, and other recovery supports to pregnant and parenting women with opioid use disorders. Seven awards were made with these funds; six of these programs have residential service options and the remaining program offers an intensive outpatient service along with MAT.
- The Department for Public Health has promoted and provided evidence-based practice materials for birthing hospitals, drug courts, treatment centers, and other agencies that serve families involved with substance abuse to educate those families on safe sleep and the prevention of abusive head trauma.
- The Kentucky Department for Public Health, Division of Maternal and Child Health is collaborating with the University of Kentucky to establish the Kentucky Center for the Prevention of NAS. This center will assure the capacity and competency of the health workforce to effectively address this maternal and child health epidemic.
- The Kentucky Department of Behavioral Health, Developmental and Intellectual Disabilities, Department for Community Based Services and the Division of Maternal and Child Health are collaborating on a plan of safe care for infants with neonatal abstinence syndrome. The Division of Maternal and Child Health is conducting regional community partnership meetings to discuss the appropriate care and follow-up of these infants to assure a safe and stable environment for these infants.
- The Kentucky Department for Medicaid Services and the Kentucky Department for Public Health are participating in the Association of State and Territorial Health Officials virtual learning collaborative on long acting reversible contraception.
- The Department for Behavioral Health and the Department for Public Health, both in the Cabinet for Health and Family Services, have obtained a three-year SAMHSA (Substance Abuse and Mental Health Services Administration) grant to implement Supporting Mothers to Achieve Recovery through Treatment and Services (SMARTS). The purpose is to expand treatment services and to increase capacity for evidence-based medication assisted treatment and other recovery support services to pregnant and postpartum (until the infant's second birthday) women with opioid use disorders through a partnership with two community mental health centers. The goal is to provide the stability needed for mothers to successfully enter and maintain recovery, reduce NAS in future pregnancies of mothers receiving treatment, and

support mothers to maintain recovery for parenting and nurturing of their infant during the critical period of hardwiring the brain.

For more information or questions about this report, please contact the Public Health Neonatal Abstinence Reporting Registry Team by email at neonatalabstinence@ky.gov.

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